Claims:

1. A method for de-noising video signals, comprising the steps of:

spatially transforming each frame of video sequences into two-dimensional bands;

decomposing the two-dimensional bands in a temporal direction to form spatial-temporal sub-bands, the step of decomposing the two-dimensional sub-bands comprising the step of applying a low band shifting method to generate shift-invariant motion reference frames; and

eliminating additive noise from each spatial-temporal sub-band.

2. The method of claim 1, wherein the step of decomposing the two-dimensional bands comprises the step of decomposing the two-dimensional bands using a motion-compensated temporal filtering technique for each two-dimensional band.

3. The method of claim 1, wherein the step of eliminating additive noise from each spatial-temporal sub-band comprises the step of using a wavelet de-noising techniques selected from a group consisting of soft-thresholding, hard-thresholding and a wavelet wiener filter.

4. The method of claim 1, wherein the step of spatially transforming each frame comprises the step of applying wavelet filtering.

5. The method of claim 1, wherein the step of applying a low band shifting method to generate shift-invariant motion reference frames comprises the step of generating a full set of wavelet coefficients for all possible shifts of a low-low sub-band.

6. The method of claim 5, further comprising the step of storing the wavelet coefficients by interleaving the wavelet coefficients such that new coordinates in an overcomplete domain correspond to an associated shift in the original spatial domain.

7. The method of claim 6, wherein the wavelet coefficients are interleaved at each decomposition level.

8. A video encoder (10), comprising:

a wavelet transformer (12) for receiving uncompressed video frames from a source thereof and transforming the frames from a spatial domain to a wavelet domain in which two-dimensional bands are represented by a set of wavelet coefficients;

means for breaking the bands into groups of frames (14);

motion compensated temporal filters (16), each receiving the group of frames of a respective one of the bands and temporally filtering the band to remove temporal correlation between the frames; and

means for texture coding (18) the temporally filtered bands, the texture coded, temporally filtered bands being combined into a bitstream.

9. The video encoder (10) of claim 8, wherein said wavelet transformer (12) is arranged to decompose each of the frames into a plurality of decomposition levels.

10. The video encoder (10) of claim 9, wherein a first one of the decomposition levels includes a low-low (LL) band, a low-high (LH) band, a high-low (HL) band, and a high-high (HH) band, and a second one of the decomposition levels includes decompositions of the LL band into LLLL (low-low, low-low), LLLH (low-low, low-high), LLHL (low-low, high-low) and LLHH (low-low, high-high) sub-bands.

11. The video encoder (10) of claim 8, wherein said motion compensated temporal filters (16) are arranged to filter the bands and generate high-pass frames and low-pass frames for each of the bands.

12. The video encoder (10) of claim 8, wherein each of said motion compensated temporal filters (16) includes a motion estimator (18) for generating at least one motion vector and a temporal filter (20) for receiving the at least one motion vector and temporally filtering a group of frames in the motion direction based thereon.

13. The video encoder (10) of claim 8, wherein said wavelet transformer (12) is arranged to apply a low band shifting method in which a full set of wavelet coefficients is generated for all possible shifts of one or more of the input bands to thereby accurately convey any shift in the spatial domain.

14. The video encoder (10) of claim 13, wherein said wavelet transformer (12) is arranged to generate the full set of wavelet coefficients by shifting the wavelet coefficients of the next-finer level LL band and applying one level wavelet decomposition, the wavelet coefficients generated during the decomposition then being combined to generate the full set of wavelet coefficients.

15. The video encoder (10) of claim 14, wherein said wavelet transformer (12) is arranged to interleave the wavelet coefficients generated during the decomposition in order to generate the full set of wavelet coefficients.